WHAT IS A LARGE CLASS?

Putting first things first, the question to be addressed as we start is "what is a large class?" This question was put to some senior academics and here are excerpts of views expressed.

- *"There is nothing like a large class. The large class is only in the mind of the orthodox teacher"*
- *"A large class is one with more students than available facilities can support"*
- *"Large classes have more than 100 students enrolled"*
- *"There is no fixed number. The large class depends on the discipline- smaller number for engineering, science and medicine and larger number for the arts, humanities, and social sciences"*

What are other views on large classes? There is no agreed definition of a large class in the literature, nor should there be. One person's large class is what some others consider as 'regular', 'small' or 'normal'. Some teachers simply define "large" as "too many students to learn names by the end of the term or semester." Whether something feels like a large class is partly a matter of the resources put into teaching it and of the skill employed by the teacher. For example, a social science lecturer who works alone with a class of 40-50 and who grades students on coursework essays and essay-type examinations finds this to be a large class. However, a language lecturer may not think 50 students makes for a large class. So, let's say that a large class is one that feels large and that a sign of this will often be that you feel that the size of the class stops you from working in your preferred way. Let's talk about making large classes feel smaller; about weakening feelings that the number of students is disempowering the professor; and about helping students to feel better engaged in large classes that are likely to experience during their college experience. For our purpose, I suggest that *a large class is one that feels large*. Signs that the class is 'large' can be:

- The class is significantly larger than you are used to.
- The resources can no longer cope with the number of students if you desire individual attention for the students.

One thing is sure. Whether we have a working definition or not, the phenomenon exists. Since we have identified some of the characteristics, we should now proceed with how to cope with it.

How Does Class Size Make a Difference?

Studies on the effects of class size have been conducted since the 1920's. Results have often been mixed, with some methods of instruction favoring small classes and other methods being as or more effective in large classes. Large classes are as effective as small classes when the goals involve learning factual information and comprehending that information. When traditional achievement tests are used to measure learning, large classes compare well with smaller classes. Smaller classes have been found more effective when instructional goals involve higher-level cognitive skills including

application, analysis, and synthesis. Smaller classes provide for greater contact between students and lecturer, which appears to be most needed for students with low motivation, those with little knowledge of the subject matter, or those who have difficulty grasping conceptual material. Smaller classes are also more effective than large ones in affecting student attitudes. In sum, the optimal size of a class depends on the instructional goals being pursued. The main advantage smaller classes have over larger ones is that they provide students with greater opportunities for interaction with subject matter, with the professor and with one another.

Now to the down side of large classes. Teaching large classes has been found to adversely affect morale, motivation and self-esteem of teachers. Although many teachers could manage a class of almost any size successfully, this could often be at the expense of the teacher's own well being and the range of learning experiences offered to students. Many teachers of large classes feel they spend too much time on organizing and managing class activities and not enough on meeting the needs of individual students.

Large classes and overcrowded classrooms also have negative effects on students' behavior and learning.

Some other problems with large classes are:

- Students become faces instead of people
- It is harder to give individual advice and guidance to students
- Organizational problems are compounded, making it difficult to schedule tutorials, laboratory sessions, and fieldwork
- There can be technical problems working with large classes e.g. difficulties in projecting slides that are clearly visible to all students.
- Monitoring of attendance can be difficult, thus encouraging students to cut classes
- Coping with large numbers of assignments and examination scripts is a source of difficulty
- The quality of feedback to students can be much reduced in large classes.

Comparing Large and Small Classes

Teachers' views on teaching larger and smaller classes	
Larger classes	**Smaller classes**
Students receive less individual attention	Students receive more individual attention
A more restricted range of teaching and learning activities	Flexibility to vary teaching and learning activities
Whole-class teaching sometimes employed for control and keeping students on task	Whole-class teaching employed when appropriate to the activity
Group work hard to manage because of too many or too large groups	Group work can be employed effectively and flexibly
Restricted opportunities for student	Better quality assessment and feedback to

assessment and individual feedback	students
Limitations to practical activities	More opportunities for active learning
Teachers work extremely hard to offset the effects of larger class size	More reasonable workloads enabling teachers to put their energies into meeting the needs of students

No doubt these obstacles are numerous. Since we cannot wish large classes away, we have to devise techniques for coping and ensure that our students benefit from participation in a large class. Let us now examine how we go about this.

Teaching Large Classes

A teacher with responsibility for teaching a large class might find the following tips useful.

Be organized - Large classes require more advance preparation and structure than small classes. Lapses in the flow of the class, while collecting thoughts or locating instructional materials, can result in loss of student attention. Before the course begins, prepare or identify a variety of instructional aids, demonstrations, and activities to support each meeting of the class. Prepare a syllabus that includes outlines for each class meeting, all project and activity descriptions, and handouts for the entire course. Provide structure to the content, and use the structure to organize each lesson. Inform the students of that structure. Taking roll or distributing materials during class is not recommended for large class situations. Student materials or instructions needed for a specific class should be made available prior to class or located so that students may obtain them with as little disruption as possible.

Connect with your students*:* - It is important to appear approachable in large classes. Build rapport with your students, and recognize the individuality of each student. Move among them when talking. Increase student access to you by getting to class early to listen to their questions, comments, or complaints. Begin by inviting students to call out something they know or recall about a topic. Display the responses as an introduction to the day's activities. Address some of the anonymity students feel in large classes. Try to learn some names, and call on those you know by name. Learn something about as many students as possible. Ask for a few volunteers each day to help with demonstrations and activities and throughout this process learn some student names.

Provide a variety of experiences - It is appropriate to vary the type of instruction in large classes to encourage discussion, interaction, and involvement. Do not attempt to lecture the entire period. Actively involve students during at least a small part of every class meeting. Form groups of three or four to discuss a problem or work on a task for a few minutes. Have a question and answer period at the beginning or end of each class.

Encourage participation - Be aware that students are often reluctant to ask or respond to questions in large classes, and it is often very difficult to hear their comments in large lecture halls. Try to be accepting of all questions and responses from students, and paraphrase or repeat every question or response. Provide hand-held microphones if acoustics are poor. Invite students to write questions or comments on index cards and give them to you at the end of class. Increase the wait time after you ask a question. Encourage students to indicate in some way when the pace of the class is too fast or too slow.

Obtain and use feedback - Students in large classes are often reluctant to communicate difficulties they are having with a course or the teaching strategies. Employ informal assessment techniques frequently to obtain student perceptions and suggestions. Use this information as a basis for making small changes in your teaching behavior before the course is completed. Inform your students if you make a change as a result of their suggestions. Ask individual students after each class meeting how the course is progressing. Provide a suggestion box, or have an envelope attached to your office door where students may leave comments about you or the course.

ACTIVE LEARNING

Includes a range of teaching and learning activities. These strategies, supported by decades of classroom research, may be thought of as a continuum from low risk to high risk for both teachers and students. Such a continuum may include (but not be limited to) strategies such as some of the following:

Exercises for Individual Students

Because these techniques are aimed at individual students, they can very easily be used without interrupting the flow of the class. These exercises are particularly useful in providing the instructor with feedback concerning student understanding and retention of material.

1. **The "One Minute Paper"** - This is a highly effective technique for checking student progress, both in understanding the material and in reacting to course material. Ask students to take out a blank sheet of paper, pose a question (either specific or open-ended), and give them <u>one</u> (or perhaps two - but not many more) minute(s) to respond. Some sample questions include: "How does John Hospers define "free will"?", "What is "scientific realism"?", "What is the activation energy for a chemical reaction?" "What is the difference between replication and transcription?", and so on. Another good use of the minute paper is to ask questions like "What was the main point of today's class material?" This tells you whether or not the students are viewing the material in the way you envisioned.

2. **Muddiest (or Clearest) Point** - This is a variation on the one-minute paper, though you may wish to give students a slightly longer time period to answer the question. Here you ask (at the end of a class period, or at a natural break in the

presentation), "What was the "muddiest point" in today's lecture?" or, perhaps, you might be more specific, asking, for example: "What (if anything) do you find unclear about the concept of 'personal identity' ('inertia', 'natural selection', etc.)?"

3. **Affective Response** - Again, this is similar to the above exercises, but here you are asking students to report their reactions to some facet of the course material - i.e., to provide an emotional or evaluative response to the material. Obviously, this approach is limited to those subject areas in which such questions are appropriate (one should not, for instance, inquire into students' affective responses to vertebrate taxonomy). However, it can be quite a useful starting point for courses such as applied ethics, particularly as a precursor to theoretical analysis. For example, you might ask students what they think of Dr. Jack Kevorkian's activities, before presenting what various moral theorists would make of them. By having several views "on the table" before theory is presented, you can help students to see the material in context and to explore their own beliefs. It is also a good way to begin a discussion of evolutionary theory or any other scientific area where the general public often has views contrary to current scientific thinking, such as paper vs. plastic packaging or nuclear power generation.

4. **Daily Journal** - This combines the advantages of the above three techniques, and allows for more in-depth discussion of or reaction to course material. You may set aside class time for students to complete their journal entries, or assign this as homework. The only disadvantage to this approach is that the feedback will not be as "instant" as with the one-minute paper (and other assignments which you collect the day of the relevant lecture). But with this approach (particularly if entries are assigned for homework), you may ask more complex questions, such as, "Do you think that determinism is correct, or that humans have free will? Explain your answer." or "Do you think that Dr. Kevorkian's actions are morally right? What would John Stuart Mill say?" and so on. Or you might have students find and discuss reports of scientific studies in popular media on topics relevant to course material, such as global warming, the ozone layer, and so forth.

5. **Reading Quiz** - Clearly, this is one way to coerce students to read assigned material! Active learning depends upon students coming to class prepared. The reading quiz can also be used as an effective measure of student comprehension of the readings (so that you may gauge their level of sophistication as readers). Further, by asking the same sorts of questions on several reading quizzes, you will give students guidance as to what to look for when reading assigned text. If you ask questions like "What color were Esmerelda's eyes?" (As my high school literature teacher liked to do), you are telling the student that it is the details that count, whereas questions like "What reason did Esmerelda give, for murdering Sebastian?" highlight issues of justification. If your goal is to instruct (and not merely to coerce), carefully choose questions which will both identify who has read the material (for your sake) and identify what is important in the reading (for

their sake).

6. **Clarification Pauses** - This is a simple technique aimed at fostering "active listening". Throughout a lecture, particularly after stating an important point or defining a key concept, stop, let it sink in, and then (after waiting a bit!) ask if anyone needs to have it clarified. You can also circulate around the room during these pauses to look at student notes, answer questions, etc. Students who would never ask a question in front of the whole class will ask questions during a clarification pause as you move about the room.

7. **Response to a demonstration or other teacher centered activity** - The students are asked to write a paragraph that begins with: I was surprised that ... I learned that ... I wonder about ... This allows the students to reflect on what they actually got out of the teachers' presentation. It also helps students realize that the activity was designed for more than just entertainment.

Questions and Answers

While most of us use questions as a way of prodding students and instantly testing comprehension, there are simple ways of tweaking our questioning techniques, which increase student involvement and comprehension. Though some of the techniques listed here are "obvious", I will proceed on the principle that the obvious sometimes bears repeating.

The "Socratic Method"

Taking its namesake from the most famous gadfly in history, this technique in its original format involved instructors "testing" student knowledge (of reading assignments, lectures, or perhaps applications of course material to a wider context) by asking questions during the course of a lecture. Typically, the instructor chooses a particular student, presents her with a question, and expects an answer forthwith; if the "chosen" student cannot answer the question presented, the instructor chooses another (and another) until the desired answer is received. This method has come under criticism, based on claims that it singles out students (potentially embarrassing them), and/or that it favors only a small segment of the class (i.e., that small percentage of the class who can answer any question thrown at them). In addition, once a student has answered a question they may not pay much attention, as it will be a long time before the teacher returns to them for a second question. In spite of these criticisms, we feel that the Socratic method is an important and useful one; the following techniques suggest variations, which enhance this method, avoiding some of these pitfalls.

8. **Wait Time** - Rather than choosing the student who will answer the question presented, this variation has the instructor WAITING before calling on someone to answer it. The wait time will generally be short (15 seconds or so) - but it may

seem interminable in the classroom. It is important to insist that no one raise his hand (or shout out the answer) before you give the OK, in order to discourage the typical scenario in which the five students in the front row all immediately volunteer to answer the question, and everyone else sighs in relief. Waiting forces every student to think about the question, rather than passively relying on those students who are fastest out of the gate to answer every question. When the wait time is up, the instructor asks for volunteers or randomly picks a student to answer the question. Once students are in the habit of waiting after questions are asked, more will get involved in the process.

9. **Student Summary of Another Student's Answer** - In order to promote active listening, after one student has volunteered an answer to your question, ask another student to summarize the first student's response. Many students hear little of what their classmates have to say, waiting instead for the instructor to either correct or repeat the answer. Having students summarize or repeat each other's contributions to the course both fosters active participation by all students and promotes the idea that learning is a shared enterprise. Given the possibility of being asked to repeat classmates' comments, most students will listen more attentively to each other.

10. **The Fish Bowl** - Students are given index cards, and asked to write down one question concerning the course material. They should be directed to ask a question of clarification regarding some aspect of the material, which they do not fully understand; or, perhaps you may allow questions concerning the application of course material to practical contexts. At the end of the class period (or, at the beginning of the next class meeting if the question is assigned for homework), students deposit their questions in a fish bowl. The instructor then draws several questions out of the bowl and answers them for the class or asks the class to answer them. This technique can be combined with others (e.g., #8-9 above, and #2).

11. **Quiz/Test Questions** - Here students are asked to become actively involved in creating quizzes and tests by constructing some (or all) of the questions for the exams. This exercise may be assigned for homework and itself evaluated (perhaps for extra credit points). In asking students to think up exam questions, we encourage them to think more deeply about the course material and to explore major themes, comparison of views presented, applications, and other higher-order thinking skills. Once suggested questions are collected, the instructor may use them as the basis of review sessions, and/or to model the most effective questions. Further, you may ask students to discuss the merits of a sample of questions submitted; in discussing questions, they will significantly increase their engagement of the material to supply answers. Students might be asked to discuss several aspects of two different questions on the same material including degree of difficulty, effectiveness in assessing their learning, proper scope of questions, and so forth.

Immediate Feedback

These techniques are designed to give the instructor some indication of student understanding of the material presented during the lecture itself. These activities provide formative assessment rather than summative assessment of student understanding. Formative assessment is evaluation of the class as a whole in order to provide information for the benefit of the students and the instructor, but the information is not used as part of the course grade; summative assessment is any evaluation of student performance which becomes part of the course grade. For each feedback method, the instructor stops at appropriate points to give quick tests of the material; in this way, she can adjust the lecture mid-course, slowing down to spend more time on the concepts students are having difficulty with or moving more quickly to applications of concepts of which students have a good understanding.

12. **Finger Signals -** This method provides instructors with a means of testing student comprehension without the waiting period or the grading time required for written quizzes. Students are asked questions and instructed to signal their answers by holding up the appropriate number of fingers immediately in front of their torsos (this makes it impossible for students to "copy", thus committing them to answer each question on their own). For example, the instructor might say "one finger for 'yes', two for 'no'", and then ask questions such as "Do all organic compounds contain carbon [hydrogen, etc.]?" Or, the instructor might have multiple choice questions prepared for the overhead projector and have the answers numbered (1) through (5), asking students to answer with finger signals. In very large classes the students can use a set of large cardboard signs with numbers written on them. This method allows instructors to assess student knowledge literally at a glance.

13. **Flash Cards** - A variation of the Finger Signals approach, this method tests students' comprehension through their response to flash cards held by the instructor. This is particularly useful in disciplines, which utilize models or other visual stimuli, such as chemistry, physics or biology. For example, the instructor might flash the diagram of a chemical compound and ask, "Does this compound react with H_2O?" This can be combined with finger signals.

14. **Quotations -** This is a particularly useful method of testing student understanding when they are learning to read texts and identify an author's viewpoint and arguments. After students have read a representative advocate of each of several opposing theories or schools of thought, and the relevant concepts have been defined and discussed in class, put on the overhead projector a quotation by an author whom they have not read in the assigned materials, and ask them to figure out what position that person advocates. In addition to testing comprehension of the material presented in lecture, this exercise develops critical thinking and analysis skills. This would be very useful, for example, in discussing the various aspects of evolutionary theory.

Critical Thinking Motivators

Sometimes it is helpful to get students involved in discussion of or thinking about course material either before any theory is presented in lecture or after several conflicting theories have been presented. The idea in the first case is to generate data or questions prior to mapping out the theoretical landscape; in the second case, the students learn to assess the relative merits of several approaches.

15. **The Pre-Theoretic Intuitions Quiz** - Students often dutifully record everything the instructor says during a lecture and then ask at the end of the day or the course "what use is any of this?" or "what good will philosophy [organic chemistry, etc.] do for us?" To avoid such questions, and to get students interested in a topic before lectures begin, an instructor can give a quiz aimed at getting students to both identify and to assess their own views. An example of this is a long "True or False" questionnaire designed to start students thinking about moral theory (to be administered on the first or second day of an introductory ethics course), which includes statements such as "There are really no correct answers to moral questions" and "Whatever a society holds to be morally right is in fact morally right". After students have responded to the questions individually, have them compare answers in pairs or small groups and discuss the ones on which they disagree. This technique may also be used to assess student knowledge of the subject matter in a pre-/post-lecture comparison. The well-known "Force Concept Inventory" developed by Hestenes to measure understanding of force and motion is another good example of this.

16. **Puzzles/Paradoxes** - One of the most useful means of ferreting out students' intuitions on a given topic is to present them with a paradox or a puzzle involving the concept(s) at issue, and to have them struggle towards a solution. By forcing the students to "work it out" without some authority's solution, you increase the likelihood that they will be able to critically assess theories when they are presented later. For example, students in a course on theories of truth might be asked to assess the infamous "Liar Paradox" (with instances such as 'This sentence is false'), and to suggest ways in which such paradoxes can be avoided. Introductory logic students might be presented with complex logic puzzles as a way of motivating truth tables, and so forth. In scientific fields you can present experimental data, which seems to contradict parts of the theory just presented or use examples, which seem to have features, which support two opposing theories.

Share/Pair

Grouping students in pairs allows many of the advantages of group work students have the opportunity to state their own views, to hear from others, to hone their argumentative skills, and so forth without the administrative "costs" of group work (time spent assigning people to groups, class time used just for "getting in groups", and so on). Further, pairs

make it virtually impossible for students to avoid participating thus making each person accountable.

17. **Discussion** - Students are asked to pair off and to respond to a question either in turn or as a pair. This can easily be combined with other techniques such as those under "Questions and Answers" or "Critical Thinking Motivators" above. For example, after students have responded to statements, such as "Whatever a society holds to be morally right is in fact morally right" with 'true' or 'false', they can be asked to compare answers to a limited number of questions and to discuss the statements on which they differed. In science classes students can be asked to explain some experimental data that supports a theory just discussed by the lecturer. Generally, this works best when students are given explicit directions, such as "Tell each other why you chose the answer you did".

18. **Note Comparison/Sharing** - One reason that some students perform poorly in classes is that they often do not have good note-taking skills. That is, while they might listen attentively, students do not always know what to write down, or they may have gaps in their notes, which will leave them bewildered when they go back to the notes to study or to write a paper. One way to avoid some of these pitfalls and to have students model good note taking is to have them occasionally compare notes. The instructor might stop lecturing immediately after covering a crucial concept and have students read each other's notes, filling in the gaps in their own note taking. This is especially useful in introductory courses or in courses designed for non-majors or special admissions students. Once students see the value of supplementing their own note taking with others', they are likely to continue the practice outside of class time.

19. **Evaluation of Another Student's Work** - Students are asked to complete an individual homework assignment or short paper. On the day the assignment is due, students submit one copy to the instructor to be graded and one copy to their partner. These may be assigned that day, or students may be assigned partners to work with throughout the term. Each student then takes their partner's work and depending on the nature of the assignment gives critical feedback, standardizes or assesses the arguments, corrects mistakes in problem-solving or grammar, and so forth. This is a particularly effective way to improve student writing.

Cooperative Learning Exercises

For more complex projects, where many heads are better than one or two, you may want to have students work in groups of three or more. As the term "cooperative learning" suggests, students working in groups will help each other to learn. Generally, it is better to form heterogeneous groups (with regard to gender, ethnicity, and academic performance), particularly when the groups will be working together over time or on complex projects; however, some of these techniques work well with spontaneously formed groups. Cooperative groups encourage discussion of problem solving techniques

and avoid the embarrassment of students who have not yet mastered all of the skills required.

20. **Cooperative Groups in Class -** Pose a question to be worked on in each cooperative group and then circulate around the room answering questions, asking further questions, keeping the groups on task, and so forth. After an appropriate time for group discussion, students are asked to share their discussion points with the rest of the class. (The ensuing discussion can be guided according to the "Questions and Answers" techniques outlined above.)

21. **Active Review Sessions** - In the traditional class review session the students ask questions and the instructor answers them. Students spend their time copying down answers rather than thinking about the material. In an active review session the instructor posses questions and the students work on them in groups. Then students are asked to show their solutions to the whole group and discuss any differences among solutions proposed.

22. **Work at the Blackboard** - In many problem-solving courses (e.g., logic or critical thinking), instructors tend to review homework or teach problem solving techniques by solving the problems themselves. Because students learn more by doing, rather than watching, this is probably not the optimal scenario. Rather than illustrating problem solving, have students work out the problems themselves, by asking them to go to the blackboard in small groups to solve problems. If there is insufficient blackboard space, students can still work out problems as a group, using paper and pencil or computers if appropriate software is available.

23. **Concept Mapping** - A concept map is a way of illustrating the connections that exist between terms or concepts covered in course material; students construct concept maps by connecting individual terms by lines, which indicate the relationship between each set of connected terms. Most of the terms in a concept map have multiple connections. Developing a concept map requires the students to identify and organize information and to establish meaningful relationships between the pieces of information.

24. **Visual Lists** - Here students are asked to make a list--on paper or on the blackboard; by working in groups, students typically can generate more comprehensive lists than they might if working alone. This method is particularly effective when students are asked to compare views or to list pros and cons of a position. One technique which works well with such comparisons is to have students draw a "T" and to label the left- and right-hand sides of the cross bar with the opposing positions (or 'Pro' and 'Con'). They then list everything they can think of which supports these positions on the relevant side of the vertical line. Once they have generated as thorough a list as they can, ask them to analyze the lists with questions appropriate to the exercise. For example, when discussing Utilitarianism (a theory which claims that an action is morally right whenever it results in more benefits than harms) students can use the "T" method to list all of

the (potential) benefits and harms of an action, and then discuss which side is more heavily "weighted". Often having the list before them helps to determine the ultimate utility of the action, and the requirement to fill in the "T" generally results in a more thorough accounting of the consequences of the action in question. In science classes this would work well with such topics as massive vaccination programs, nuclear power, eliminating chlorofluorocarbons, reducing carbon dioxide emissions, and so forth.

25. **Jigsaw Group Projects** - In jigsaw projects, each member of a group is asked to complete some discrete part of an assignment; when every member has completed his assigned task, the pieces can be joined together to form a finished project. For example, students in a course in African geography might be grouped and each assigned a country; individual students in the group could then be assigned to research the economy, political structure, ethnic makeup, terrain and climate, or folklore of the assigned country. When each student has completed his research, the group then reforms to complete a comprehensive report. In a chemistry course each student group could research a different form of power generation (nuclear, fossil fuel, hydroelectric, etc.). Then the groups are reformed so that each group has an expert in one form of power generation. They then tackle the difficult problem of how much emphasis should be placed on each method.

26. **Role Playing** - Here students are asked to "act out" a part. In doing so, they get a better idea of the concepts and theories being discussed. Role-playing exercises can range from the simple (e.g., "What would you do if a Nazi came to your door, and you were hiding a Jewish family in the attic?") to the complex. Complex role-playing might take the form of a play (depending on time and resources); for example, students studying ancient philosophy might be asked to recreate the trial of Socrates. Using various sources (e.g., Plato's dialogues, Stone's The Trial of Socrates, and Aristophanes' The Clouds), student teams can prepare the prosecution and defense of Socrates on the charges of corruption of youth and treason; each team may present witnesses (limited to characters which appear in the Dialogues, for instance) to construct their case, and prepare questions for cross-examination.

27. **Panel Discussions** - Panel discussions are especially useful when students are asked to give class presentations or reports as a way of including the entire class in the presentation. Student groups are assigned a topic to research and asked to prepare presentations (note that this may readily be combined with the jigsaw method outlined above). Each panelist is then expected to make a very short presentation, before the floor is opened to questions from "the audience". The key to success is to choose topics carefully and to give students sufficient direction to ensure that they are well prepared for their presentations. You might also want to prepare the "audience", by assigning them various roles. For example, if students are presenting the results of their research into several forms of energy, you might have some of the other students role-play as concerned environmentalists,

transportation officials, commuters, and so forth.

28. **Debates** - Actually a variation of #27, formal debates provide an efficient structure for class presentations when the subject matter easily divides into opposing views or ‘Pro’/‘Con’ considerations. Students are assigned to debate teams, given a position to defend, and then asked to present arguments in support of their position on the presentation day. The opposing team should be given an opportunity to rebut the argument(s) and, time permitting, the original presenters asked to respond to the rebuttal. This format is particularly useful in developing argumentation skills (in addition to teaching content).

29. **Games** - Many will scoff at the idea that one would literally play games in a university setting, but occasionally there is no better instructional tool. In particular, there are some concepts or theories, which are more easily illustrated than discussed, and in these cases, a well-conceived game may convey the idea more readily. For example, when students are introduced to the concepts of "laws of nature" and "the scientific method", it is hard to convey through lectures the nature of scientific work and the fallibility of inductive hypotheses. Instead, students play a couple rounds of the Induction Game, in which playing cards are turned up and either added to a running series or discarded according to the dealer’s pre-conceived "law of nature". Students are asked to "discover" the natural law, by formulating and testing hypotheses as the game proceeds.

Specific Examples:

1) Peoples knowledge of population growth
2) Case Study - Population Control
3) Erosion
4) Case Study – rebuilding a city

Select Active Learning Articles (1995-2004)
from Charles C. Bonwell, January, 2005

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